

REMARKS/ARGUMENTS

Applicants acknowledge with appreciation the indication that claims 21-31 and 42-44 are allowed and that claims 11-20 recite patentable subject matter and would be allowable if rewritten in independent form to include all of the features of their respective base claims and any intervening claims. By the present Amendment, Applicants have not amended any of allowed claims 21-31 and 42-44. Accordingly, Applicants respectfully submit that claims 21-31 and 42-44 should remain allowed. Also, Applicants have respectfully maintained claims 11-20 in dependent form because it is believed that their respective base claims patentably define over the cited art, for at least the reasons discussed herein.

Applicants have previously addressed the Hampden-Smith reference. As for the new reference, Tsukada (U.S. 4,937,150), it does not teach the claimed phosphor. Rather, it teaches a coated particle in a matrix.

The newly cited reference, the '150 patent, teaches an electroluminescent device where ultra-fine particles of zinc sulfide are coated with a different material such as an oxide or a nitride and then embedded in a polymer matrix to form a phosphor layer for an electroluminescent device. The particles of zinc sulfide are specified to be in the range of 100s to 1000s of Angstroms (10s to 100s of nanometers). This is different from the claimed invention wherein a phosphor film is vacuum deposited in such a manner that the individual grains of the phosphor film have a size smaller than 50 nanometers.

First, the phosphor film of the present claims consists only of zinc sulfide, whereas the phosphor film of the '150 patent consists of coated zinc sulfide particles dispersed in a polymer matrix. The ultrafine zinc sulfide particles of the '150 invention are produced by flash heating of zinc sulfide to evaporate and condense discrete small particles whereas the particles of the present claims are formed in-situ as part of a contiguous vacuum deposited film. A means of depositing the vacuum deposited film of the present invention cannot be inferred from the methods of the '150 patent. More specifically, the phosphor film of the present invention is produced by sputtering under a specific set of conditions including a substrate temperature between ambient and 300C, a deposition rate between 5 and 100 Angstroms per second, a sputtering atmosphere of

argon at a pressure in the range 0.5 to 5×10^{-2} torr and an oxygen partial pressure in the sputtering atmosphere less than about 0.05 percent of this working pressure.

Non-standard sputtering conditions must be used to obtain thin films with grain sizes as specified in the claims of the present invention.

Second, the phosphor grains of the present invention are columnar with the columns aligned along the 111 crystallographic direction, whereas those of the '150 invention, based on the methods described, are equiaxed, and randomly oriented within the phosphor film.

Third, the phosphor grains of the '150 patent are coated with a second material to form pn junctions between the two materials, whereas the phosphor grains of the present invention are uncoated. However, the surfaces of the contiguous film of the present invention may be coated.

The luminance and operating lifetime of the films of the present invention are much higher than those of the '150 patent. Although the '150 patent claims a high luminance, this luminance is compared with the luminance of similar devices having larger grains dispersed in a polymer matrix. This type of electroluminescent device is known in the art as a powder or dc electroluminescent device and is known by those skilled in the art to have lower luminance and lifetime than the ac thin film phosphor electroluminescent device of the present invention.

Furthermore, the phosphor films of the present invention are vacuum deposited, and it should be known by one skilled in the art that the term "thin film" refers to a vacuum deposited film. By contrast, the phosphor films of the '150 patent would be known as "thick films" by one skilled in that art.

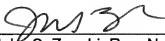
CONCLUSION

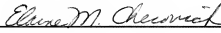
For at least the reasons detailed above, it is respectfully submitted all claims remaining in the application (Claims 1, 3 and 6-44) are now in condition for allowance.

Respectfully submitted,

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Date


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